TACC Invitational Written Exam of Java Esoterica and Other Forbidden Magics, 4/27/19

All code and responses are based on Java 1.8. For all problems that use standard libraries such as ArrayList, assume that they have been imported. For all output statements, assume that the System class has been statically imported.

1.	Which of the following has the same value as BF_{16}? A. 277 B. 191_{16} C. 277_8 D. 277_{16} E. None of the above		C
2.	What is the value of the expression 2 / 3 * 3.0 + 1? A. 3 B. 1 C. 2.66 D. 2.7 E. None of the above		B
3.	What is the output of the code below? `out.printf("%3.0f", 6.7);`	A. 6 B. 6.700 C. 7 D. 7.000 E. None of the above	C
4.	Which of the following would evaluate to the value "cde"?	A. "abcdef".substring(2) B. "abcde".substring(2, 3) C. "abcde".substring(3, 3) D. "abcde".substring(2, 5) E. None of the above	D
5.	What is the value of the expression: `true && !true || true`	A. true B. false C. 3 D. Wednesdsay E. None of the abovvveeeee	A
6.	What is the output of the following code? `out.println(Math.ceil(-3.6f));`	A. -3 B. -3.0 C. -4 D. -4.0 E. None of the above	B

7.	What is the output of the following code?
	
	`int n = 3;`
	`float f = n`
	`String s = 3 + f + "f";`
	`out.println(s);`
		A. 3f
		B. 6
		C. 6f
		D. 6.0f
		E. None of the above
			D

8.	What is the output of the code to the right?
	
	A. 2
	B. 3
	C. 4
	D. 5
	E. None of the above
		`int a = 3;`
		`switch(a) {`
		`  case 3: a++;`
		`  case 4: a++;`
		`  case 5: a++;`
		`  default: a--;`
		`}`
		`out.println(a);`
			D

9.	What is output by the following code?
	
	`for (int i = 1; i < 5; i *= 5) {`
	`  out.print(i + " ");`
	`}`
		A. 1 5 10 15 25
		B. 1 5 10 15 20
		C. 1 5 25
		D. 1 5
		E. None of the above
			E

10.	Given the array definition below, which of the following expressions is equivalent to 5? `int[] a = { 1, 3, 5, 7, 9 };`	A. a[3] B. a[a[2]] C. a[3] – a[2] D. a[3] – 2 E. None of the above	D

11.	Assuming the variable scan is a reference to a Scanner object for a file with multiple lines of input. Which values returned by scan.nextLine() will cause the loop shown below to terminate?
	
	`while(`
	`  scan.nextLine().length > 0`
	`) { }`
		A. "a"
		B. "0"
		C. "\t"
		D. "\n"
		E. None of the above
			D

12.	What integer value of n will cause the code to the right to output the value 2?
	
	A. 3
	B. 4
	C. 5
	D. 6
		`int starting = 25;`
		`for (int i = 1; i < 3; i++) {`
		`  starting = starting / n;`
		`}`
		`out.println(starting);`
			A

13.	What is output by the code below? `out.println(10 << 2 << 2 % 10);`	A. 0 B. 4 C. 100 D. 160 E. None of the above	D
14.	What is the value of the expression Integer.MAX_VALUE?	A. 2147484637 B. 2147484638 C. 2147483647 D. 2147483648 E. I dunno, Google it.	C

15.	What is output by the code to the right?
	
	A. 0
	B. 1
	C. 3
	D. 6
	E. None of the above
		`ArrayList a = new ArrayList();`
		`ArrayList b = new ArrayList();`
		`for (int i = 0; i < 3; i++) {`
		`  b.add(i);`
		`  a.add(b);`
		`}`
		`out.println(a.size());`
			C

16.	What is output by the code below? `out.println(2 ^ 3 ^ 0);`	A. 0 B. 1 C. 6 D. 8 E. None of the above	B

17.	What is output by the code to the right?
	
	A. 0
	B. 1
	C. 3
	D. 6
	E. None of the above
		`ArrayList a = new ArrayList();`
		`ArrayList b = new ArrayList();`
		`for (int i = 0; i < 3; i++) {`
		`  b.add(i);`
		`  a.add(b);`
		`}`
		`out.println(a.size());`
			C

18.	What is the value of `frameDepth` when a recursive call to `recurses(20, 1)` begins to unwrap via its base case?
	
	A. 1
	B. 4
	C. 5
	D. 10
		`void recurses(int val, int frameDepth) {`
		`  if (val < frameDepth) {`
		`  return frameDepth;`
		`  } else {`
		`  return frameDepth +`
		`  recurses(`
		`  val / 2,`
		`  frameDepth + 1`
		`  )`
		`  }`
		`}`
			B

19.	What is the resulting value of the Java expression: `-5.7f % -2`	A. -1.7f B. -2.0f C. -2 D. 1.7 E. None of the above	E

20.	What values of **a** and **b** will cause Loop A and Loop B to have the same output?
	
	Loop A:
	
	`int i = 0;`
	`while (i <= 4) {`
	`  i++;`
	`  out.print(i);`
	`}`
	
	Loop B:
	
	`for (int i = a; i < b; i++) {`
	`  out.print(i);`
	`}`
		A. a = 0, b = 3
		B. a = 1, b = 4
		C. a = 0, b = 5
		D. a = 1, b = 6
		E. None of the above
			D

21.	What is output by the code below? `out.println(5 / 4 / 2 * 2.0)`	A. 0 B. 0.0 C. 1.0 D. 2.0 E. None of the above	B

22.	`// question 22`
	`ArrayList< Stack<int> > a =`
	`  new ArrayList();`
	
	`for (int i = 0; i < 4; i++) {`
	
	`  // question 23`
	`  Stack< Integer > s = new Stack();`
	`  for (int j = 0; j < i; j++) {`
	
	`  // question 24`
	`  s.push(j);`
	`  }`
	`  a.add( s );`
	`}`
	
	`while (!a.isEmpty()) {`
	`  Stack< Integer > s = a.remove(0);`
	`  while (!s.empty()) {`
	`  out.print(s.pop());`
	`  }`
	`}`
		22. What best describes the data structure on the line marked `// question 22`?
		
		A. An ArrayList of ints
		B. A Stack of ints
		C. An ArrayList of Stacks
		D. A Stack of ArrayLists
		E. None of the above.
			D

23.		23. What functionality of Java's type system allows the result of `a.remove` to return an instance of type `Stack< Integer >` on the line marked `// question 23`? A. Autoboxing B. Generics C. Templating D. Typecasting E. None of the above	B
24.		24. What functionality of Java's type system allows the push operation of the variable `j` of type `int` to a Stack that contains objects of type `Integer` on the line marked `// question 24`? A. Autoboxing B. Generics C. Templating D. Typecasting E. None of the above	A
25.		25. What is the output of this code? A. 001012 B. 012010 C. 010210 D. 0102103210 E. None of the above	C

26.	What is output by the code below?
	
	`out.println(`
	`  Integer.parseInt("1001", 3)`
	`);`
		A. 9
		B. 28
		C. 1101002
		D. 111101001
		E. None of the above
			B

27.	class o_o {
	  int a = 3;
	  void b_b() {
	  out.println(a);
	  }
	}
	
	class q_q extends o_o {
	  float a = 5.0f;
	  void b_b() {
	  out.println(a);
	  }
	}
	
	// CLIENT CODE
	ArrayList<o_o > a new ArrayList();
	a.add(new q_q());
	
	// question 27
	out.println(a.get(0).a);
	
	// question 28
	out.println(((o_o)a.get(0)).a);
	
	// question 29
	out.println(((q_q)a.get(0)).a);
	
	// question 30
	a.get(0).b_b();
	
	// question 31
	((o_o)(a.get(0))).b_b();
		27. What is printed by the output statement marked // question 27?
		
		A. 3
		B. 3.0
		C. 5
		D. 5.0
		E. None of the above
			A

28.		28. What is printed by the output statement marked // question 28? A. 3 B. 3.0 C. 5 D. 5.0 E. None of the above	A
29.		29. What is printed by the output statement marked // question 29? A. 3 B. 3.0 C. 5 D. 5.0 E. None of the above	D
30.		30. What is printed by the output statement marked // question 30? A. 3 B. 3.0 C. 5 D. 5.0 E. None of the above	D
31.		31. What is printed by the output statement marked // question 31? A. 3 B. 3.0 C. 5 D. 5.0 E. None of the above	D

<table>
<tr><td>32.</td><td rowspan="4">String a = “oh”;
String b = “hai”;
String c = “ohhai”;
String d = a;
String e = a + b;
// question 32
out.println(a == d);

// question 33
out.println(a == “oh”);

// question 34
out.println(e == c);

// question 35
out.println(e == a + b);</td><td>32. What is output by the line marked // question 32?

A. true
B. false</td><td>A</td></tr>
<tr><td>33.</td><td>33. What is output by the line marked // question 33?

A. true
B. false</td><td>A</td></tr>
<tr><td>34.</td><td>34. What is output by the line marked // question 34?

A. true
B. false</td><td>B</td></tr>
<tr><td>35.</td><td>35. What is output by the line marked // question 35?

A. true
B. false</td><td>B</td></tr>
<tr><td>36.</td><td colspan="2">Consider a binary tree that uses a recursive search algorithm:

Node search(Node n, int value) {
  return n.value == value ? n : (value < n.value ? n.left : n.right);
}

What is the maximum number of comparisons required to locate a node at depth 3?

A. 4 B. 5 C. 6 D. 7 E. None of the above</td><td>B</td></tr>
<tr><td>37.</td><td colspan="2">Which of the following is equivalent to the Boolean expression $!AA + !A!A + A!A$?

A. A B. $!A$ C. $True$ D. $False$ E. None of the above</td><td>B</td></tr>
<tr><td>38.</td><td colspan="2">Which of the following expressions listed below represents the least Order of Complexity

A. O(n) B. O($\log_2$ n) C. O(N $\log_2$ N) D. O(N^2)</td><td>B</td></tr>
<tr><td>39.</td><td colspan="2">What dimensions are required for a matrix to represent a weighted, directed graph with 3 nodes?

A. 1x1 B. 1x3 C. 3x1 D. 3x3 E. None of the above</td><td>D</td></tr>
<tr><td>40.</td><td colspan="2">What is the name of the forthcoming TACC system, to be deployed and become operational later this year?

A. Lonestar 5 B. Lonestar 6. C. Stampede2 D. Frontera E. None of the above</td><td>D</td></tr>
</table>

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